

Appl. No. 09/322,259
Appeal Brief



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**IN THE UNITED STATES
PATENT AND TRADEMARK OFFICE**

Appl. No.: 09/322,259
Applicant(s): John Reagan, et al.
Filed: May 28, 1999
Title: IMPROVED VOCODER METHOD
TC/A.U.: 2600/2655
Examiner: Michael H. Opsasnick
Atty. Docket: PHA 51,214

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On: 022 November 2004

By: William S. Francos
William S. Francos

APPEAL BRIEF

Honorable Assistant Commissioner of Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

In connection with the Notice of Appeal filed on September 22, 2004, Applicants provide the following Appeal Brief in the above captioned application.

1. Real Party in Interest

The real party in interest as assignee of the entire right

and title to the invention described in the present application is Koninklijke Philips N.V. having a principle place of business at Groenewoudseweg 2, Eindhoven, The Netherlands. (The undersigned notes that the assignment documents were filed on even date by facsimile by counsel for Philips.)

2. Related Appeals and Interferences

There are no known related appeals or interferences at this time.

3. Status of the Claims

Claims 1-16 are pending in the present application. All have been finally rejected. Rejected claims 1-16 are duplicated in Appendix I.

4. Status of Amendments

A Final Office Action on the merits was mailed on June 22, 2004. In response thereto, a Reply traversing the substance of the final rejection was filed by facsimile on August 23, 2004. An Advisory Action was mailed October 22, 2004.

5. Summary

In one embodiment, a method of reducing sinusoidal artifact generation in a vocoder, includes receiving a determined input energy threshold value below which a suspected noise-inducing codebook excitation vector is expected to be generated by the vocoder. Provided an input signal is received having an energy value lower than the input energy threshold value, the method includes using a selection process such that the suspected noise-inducing codebook excitation vector is not continuously generated. The input signal comprises a plurality

of subframes, the subframes encoded at half-rate or greater, at least a portion of the subframes have a zero or low-level input, and each of the subframes having the zero or low-level input results in a randomized selection of a single codebook excitation vector. (Kindly refer to Figs. 2 and 3 and page 12, line 1 through page 18, line 15 of the filed application.)

Another embodiment is drawn to a computer implemented method of reducing sinusoidal artifact generation in a vocoder. The method includes receiving a determined input energy threshold value below which a suspected noise-inducing codebook excitation vector is expected to be generated by the vocoder. Provided an input signal is received having an energy value lower than the input energy threshold value, the method includes using a selection process such that the suspected noise-inducing codebook excitation vector is not continuously generated. The input signal comprises a plurality of subframes, the subframes encoded at half-rate or greater, at least a portion of the subframes have a zero or low-level input, and each of the subframes having the zero or low-level input results in a randomized selection of a single codebook excitation vector. (Kindly refer to Figs. 1-3 and page 9, line 25 through page 18, line 15 of the filed application.)

Another example embodiment is drawn to a computer system having a processor coupled to a bus, a computer readable memory unit coupled to the bus and having stored therein a computer program that when executed by the processor causes the computer system to implement a method of reducing sinusoidal artifact generation in a vocoder. The method includes receiving a determined input energy threshold value below which a suspected noise-inducing codebook excitation vector is expected to be generated by the vocoder. Provided an input signal is received having an energy value lower than the input energy threshold

value, the method includes using a selection process such that the suspected noise-inducing codebook excitation vector is not continuously generated. The input signal comprises a plurality of subframes, the subframes encoded at half-rate or greater, at least a portion of the subframes have a zero or low-level input, and each of the subframes having the zero or low-level input results in a randomized selection of a single codebook excitation vector. (Kindly refer to Figs. 1-3 and page 9, line 25 through page 18, line 15 of the filed application.)

In yet another example embodiment, a computer system includes a processor and an address/data bus coupled to the processor. The system also includes a computer readable memory coupled to communicate with the processor. In order to reduce sinusoidal artifact generation, the processor receives a determined input energy threshold value below which a suspected noise-inducing codebook excitation vector is expected to be generated by the vocoder. Provided an input signal is received having an energy value lower than the input energy threshold value, the processor uses a selection process such that the suspected noise-inducing codebook excitation vector is not continuously generated. The input signal comprises a plurality of subframes, the subframes encoded at half-rate or greater, at least a portion of the subframes have a zero or low-level input, and each of the subframes having the zero or low-level input results in a randomized selection of a single codebook excitation vector. (Kindly refer to Figs. 1-3 and page 9, line 25 through page 18, line 15 of the filed application.)

6. Concise Statements of Rejections/Objections

1. Claims 1-16 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Tzeng (U.S. Patent 5,293,449) in view

of *Dejaco* (U.S. Patent 6,484,138) further in view of *Su* (U.S. Patent 5,664,054).

7. Rejection Under 35 U.S.C. § 103(a)

I. Claims 1-16.

Applicants respectfully traverse the propriety of the rejection of claims 1-16 under 35 U.S.C. § 103(a) in view of *Tzeng* (U.S. Patent 5,293,449) in view of *Dejaco* (U.S. Patent 6,484,138) further in view of *Su* (U.S. Patent 5,664,054) for at least the reasons set forth below.

A proper rejection under 35 U.S.C. § 103(a) requires that **all** of the claimed elements be found in the applied art. If a **single** claimed element is not found in the applied art, a prima facie case of obviousness cannot be properly established.

Furthermore, obviousness can only be established by combining or modifying the teachings of the prior art to produce the claimed invention where there is a teaching, suggestion or motivation to do so found in the references themselves or in the knowledge generally available to one of ordinary skill in the art. *In re Fine* 5 USPQ 2d 1596 (1988). However, hindsight is never an appropriate motivation for combining references and/or the requisite knowledge available to one having ordinary skill in the art. To this end, relying upon hindsight knowledge of applicants' disclosure when the prior art does not teach nor suggest such knowledge results in the use of the invention as a template for its own reconstruction. This is wholly improper in the determination of patentability. *Sensonics Inc. v Aerosonics Corp.*, 38 USPQ 2d 1551-1554 (1996), citing *W.L. Gore & Associates, Inc. v. Garlock, Inc.* 220 USPQ 303.

Independent claims 1, 5, and 9 each feature, inter alia: *receiving a determined **input energy threshold** value below which a **suspected noise-inducing codebook excitation vector is expected to be generated** by said vocoder; and b) provided an input signal is received having an energy value lower than said input energy threshold value, using a selection process **such that said suspected noise-inducing codebook excitation vector is not continuously generated...*** Claim 13 includes a similar feature.

It is respectfully submitted that the applied art lacks at least the disclosure of these features of the independent claims.

The Office Action asserts that the reference to Tzeng discloses *...receiving...by said vocoder* as calculating means square error to determine if a threshold has been met (col. 8, lines 55-61) [and] *...provided an input signal...continuously generated* as measuring the amount of energy in the signal, and choosing either a voice codebook or unvoiced codebook (col. 8 lines 11-48)... (Kindly refer to page 2 of the Final Office Action.)

Initially, it is noted that the Office Action does not clearly address all features of paragraphs *`a)`* and *`b)`* set forth in the independent claims. To wit, it is respectfully submitted that the Office Action fails to clearly set forth a rejection in view of Tzeng at least as the reference relates to these paragraphs. Rather, portions of these paragraphs are recited followed by a description of a teaching of the reference, with no clear correlation as to how the referenced description discloses the features of the claims. As such, it is respectfully submitted that the Office Action does not meet the requirement of providing a clearly articulated rejection

under MPEP § 706. Therefore, and for at least this reason, it is respectfully submitted that the Office Action is improper and should be withdrawn.

The above traversal notwithstanding, it is respectfully submitted that the reference to Tzeng lacks at least the disclosure of the featured determined input energy value and selection process based on an input energy threshold value. Rather, the reference to Tzeng discloses an analysis-by-synthesis approach, in which an excitation model circuit receives a distortion analysis signal for each applied excitation signal and compares the distortion analysis signals. The circuit determines which of the excitation signals that provide optimal reconstructed speech. Moreover, the reference to Tzeng discloses a codebook arrangement having a **menu of possible excitation signal models**. The codebook arrangement is for a voiced excitation generator 408 and a Gaussian noise generator. For the analysis by synthesis operation the voiced excitation codebook 408 outputs **each of a possible codebook pulse train having a different pitch period**; and the Gaussian noise generator outputs each of a plurality of Gaussian sequences for use as an excitation signal. Each Gaussian sequence has a different random sequence. However, it is respectfully submitted that the reference to Tzeng neither discloses the **suspected noise-inducing codebook excitation vector** nor a **selection process** such that the **suspected noise-inducing codebook excitation vector is not continuously generated**. (Kindly refer to column 7, line 56 through column 8, line 61 for support for the above assertions.)

Accordingly, while the reference to Tzeng does disclose the use of a codebook pulse train for synthesis, it lacks at

least the disclosure of *receiving a determined input energy threshold value below which a suspected noise-inducing codebook excitation vector is expected to be generated*; and using a *selection process such that said suspected noise-inducing codebook excitation vector is not continuously generated...*"

For at least the reasons set forth above, it is respectfully submitted that the reference to Tzeng lacks at least the disclosure of one of the features of independent claims 1, 5, 9 and 13. Because the reference lacks the disclosure of at least one feature, Tzeng cannot serve to form a prima facie case of obviousness of these claims. Accordingly, independent claims 1, 5, 9 and 13 are patentable over the applied art. Moreover, claims 2-4, 6-8 10-12 and 14-16 depend from respective independent claims, and thus include the subject matter of these claims and any intervening claims. Because claims 1, 5, 9 and 13 are patentable over the applied art for at least the reasons set forth above, claims 2-4, 6-8 10-12 and 14-16 are allowable at least because of their dependence on respective independent base claims. Allowance is respectfully requested.

While the pending claims are allowable for at least the reasons set forth above, Applicants also respectfully traverse the propriety of the present rejection for additional reasons. To wit, it is respectfully submitted that the Office Action attempts to fabricate a patchwork mosaic of various pieces of prior art based on Applicants' teachings. Not only do the disclosures of the applied art lack at least the features of the claims as discussed above, it is submitted that the requisite motivation to combine the references is not provided. In particular, the rejection provides certain benefits of one reference as a motivation for combining this reference with

another. This does not provide the motivation to combine the reference. Rather, there must be a suggestion provided **in the reference** for its combination. It is respectfully submitted that the requisite motivation has not been provided from the references themselves.

9. Payment of Fees

Permission is hereby given to charge Deposit Account 50-0238 for the fee required for the present Brief provided by 37 C.F.R. § 1.17(c).

10. Conclusion

In view of the foregoing, applicant(s) respectfully request(s): the withdrawal of all objections and rejections of record; the allowance of all the pending claims; and the holding of the application in condition for allowance. If any points remain in issue that may best be resolved through a personal or telephonic interview, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and further replies to charge payment or credit any overpayment to Deposit Account Number 50-0238 for any additional fees under 37 C.F.R. §1.16 or under 37 C.F.R. §1.17.

In the event that there are any outstanding matters remaining in the present application, the Examiner is invited to contact William S. Francos, Esq. (Reg. No. 38,456) at (610) 375-3513 to discuss these matters.

Respectfully submitted on behalf of:
Koninklijke Philips N.V.

A handwritten signature in black ink, appearing to read 'William S. Francos', is written over a horizontal line.

by: William S. Francos, Esq. (Reg. No. 38,456)

November 22, 2004
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APPENDIX I

Claims on Appeal

1. A computer implemented method of reducing sinusoidal artifact generation in a vocoder, said computer implemented method comprising the steps of:

a) receiving a determined input energy threshold value below which a suspected noise-inducing codebook excitation vector is expected to be generated by said vocoder; and

b) provided an input signal is received having an energy value lower than said input energy threshold value, using a selection process such that said suspected noise-inducing codebook excitation vector is not continuously generated;

wherein the input signal comprises a plurality of subframes, the subframes encoded at half-rate or greater, at least a portion of the subframes have a zero or low-level input, and each of the subframes having the zero or low-level input results in a randomized selection of a single codebook excitation vector.

2. The computer implemented method of reducing sinusoidal artifact generation in a vocoder as recited in Claim 1 wherein step a) comprises:

receiving said determined input energy threshold value having a value of approximately $4 \sigma^2$.

3. The computer implemented method of reducing sinusoidal artifact generation in a vocoder as recited in Claim 1 wherein step b) comprises:

b1) calculating a sum of squares value for said input signal; and

b2) provided said sum of squares value for said input signal is less than said input energy threshold value and provided that a candidate codebook index equals 1, performing a randomization codebook excitation vector selection process such that said suspected noise-inducing codebook excitation vector is prevented from being continuously generated.

4. The computer implemented method of reducing sinusoidal artifact generation in a vocoder as recited in Claim 1 wherein step b) comprises:

b1) calculating a sum of squares value for said input signal; and

b2) provided said sum of squares value for said input signal is less than said input energy threshold value and provided that a candidate codebook index does not equal 1, utilizing said suspected noise-inducing codebook excitation vector.

5. In a computer system having a processor coupled to a bus, a computer readable memory unit coupled to said bus and having stored therein a computer program that when executed by said processor causes said computer system to implement a method of reducing sinusoidal artifact generation in a vocoder, said method comprising the steps of:

a) receiving a determined input energy threshold value below which a suspected noise-inducing codebook excitation vector is expected to be generated by said vocoder; and

b) provided an input signal is received having an energy value lower than said input energy threshold value, using a selection process such that said suspected noise-inducing codebook excitation vector is not continuously generated;

wherein the input signal comprises a plurality of subframes, the subframes encoded at half-rate or greater, at least a portion of the subframes have a zero or low-level input, and each of the subframes having the zero or low-level input results in a randomized selection of a single codebook excitation vector.

6. The computer readable memory unit as described in Claim 5 wherein said computer program stored therein when executed by said processor causes said computer system performing said step a) to further perform the step of:

receiving said determined input energy threshold value having a value of approximately $4 q^2$.

7. The computer readable memory unit as described in Claim 5 wherein said computer program stored therein when executed by said processor causes said computer system performing said step b) to further perform the steps of:

b1) calculating a sum of squares value for said input signal; and

b2) provided said sum of squares value for said input signal is less than said input energy threshold value and provided that a candidate codebook index equals 1, performing a randomization codebook excitation vector selection process such that said suspected noise-inducing codebook excitation vector is prevented from being continuously generated.

8. The computer readable memory unit as described in Claim 5 wherein said computer program stored therein when executed by said processor causes said computer system performing said step b) to further perform the step of:

b1) calculating a sum of squares value for said input signal; and

b2) provided said sum of squares value for said input signal is less than said input energy threshold value and

provided that a candidate codebook index does not equal 1, utilizing said suspected noise-inducing codebook excitation vector.

9. A computer system comprising:

a processor;

an address/data bus coupled to said processor;

a computer readable memory coupled to communicate with said processor, said processor for performing the vocoder sinusoidal artifact generation reduction steps of:

a) receiving a determined input energy threshold value below which a suspected noise-inducing codebook excitation vector is expected to be generated by said vocoder; and

b) provided an input signal is received having an energy value lower than said input energy threshold value, using a selection process such that said suspected noise-inducing codebook excitation vector is not continuously generated;

wherein the input signal comprises a plurality of subframes, the subframes encoded at half-rate or greater, at least a portion of the subframes have a zero or low-level input, and each of the subframes having the zero or low-level input results in a randomized selection of a single codebook excitation vector.

10. The computer system as recited in Claim 9 wherein at said step a) said processor performs the vocoder sinusoidal artifact generation reduction steps of:

receiving said determined input energy threshold value having a value of approximately $4 q^2$.

11. The computer system as recited in Claim 9 wherein at said step b) said processor performs the vocoder sinusoidal artifact generation reduction steps of:

b1) calculating a sum of squares value for said input signal; and

b2) provided said sum of squares value for said input signal is less than said input energy threshold value and provided that a candidate codebook index equals 1, performing a randomization codebook excitation vector selection process such that said suspected noise-inducing codebook excitation vector is prevented from being continuously generated.

12. The computer system as recited in Claim 9 wherein at said step b) said processor performs the vocoder sinusoidal artifact generation reduction steps of:

b1) calculating a sum of squares value for said input signal; and

b2) provided said sum of squares value for said input signal is less than said input energy threshold value and provided that a candidate codebook index does not equal 1, utilizing said suspected noise-inducing codebook excitation vector.

13. A method of reducing sinusoidal artifact generation in a vocoder, said method comprising the steps of

a) determining an input energy threshold value below which a suspected noise-inducing codebook excitation vector is expected to be generated by said vocoder; and

b) provided an input signal is received having an energy value lower than said input energy threshold value, using a selection process such that said suspected noise-inducing codebook excitation vector is not continuously generated;

wherein the input signal comprises a plurality of subframes, the subframes encoded at half-rate or greater, at least a portion of the subframes have a zero or low-level input, and each of the subframes having the zero or low-level input results in a randomized selection of a single codebook excitation vector.

14. The method of reducing sinusoidal artifact generation in a vocoder as recited in Claim 13 wherein step a) comprises:

determining said input energy threshold value to be approximately $4 q_2$.

15. The method of reducing sinusoidal artifact generation in a vocoder as recited in Claim 13 wherein step b) comprises:

b1) calculating a sum of squares value for said input signal; and

b2) provided said sum of squares value for said input signal is less than said input energy threshold value and provided that a candidate codebook index equals 1, performing a randomization codebook excitation vector selection process such that said suspected noise-inducing codebook excitation vector is prevented from being continuously generated.

16. The method of reducing sinusoidal artifact generation in a vocoder as recited in Claim 13 wherein step b) comprises:

b1) calculating a sum of squares value for said input signal; and

b2) provided said sum of squares value for said input signal is less than said input energy threshold value and provided that a candidate codebook index does not equal 1, utilizing said suspected noise-inducing codebook excitation vector.

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APPENDIX II
Applied References



APPENDIX III

Cited Court Decisions

1. *In re Fine* 5 USPQ 2d 1596 (1988).
2. *Sensonics Inc. v Aerosonics Corp.*, 38 USPQ 2d 1551-1554 (1996).

FULL TEXT OF CASES (USPQ2D)

All Other Cases

In re Fine (CA FC) 5 USPQ2d 1596 (1/26/1988)

In re Fine (CA FC) 5 USPQ2d 1596

In re Fine

U.S. Court of Appeals Federal Circuit
5 USPQ2d 1596

Decided January 26, 1988

No. 87-1319

Headnotes

PATENTS

1. Patentability/Validity -- Obviousness -- Evidence of (§ 115.0903)

Patent and Trademark Office improperly rejected claimed invention for obviousness since nothing in cited references, either alone or in combination, suggests or teaches claimed invention, since there is consequently no support for PTO's conclusion that substitution of one type of detector for another in prior art system, resulting in claimed invention, would have been obvious, and since PTO therefore failed to satisfy its burden of establishing prima facie case of obviousness by showing some objective teaching or generally available knowledge that would lead one skilled in art to combine teachings of existing references.

2. Patentability/Validity -- Obviousness -- In general (§ 115.0901)

Obviousness is tested by what combined teachings of prior art references would have suggested to those of ordinary skill in art, not by whether particular combination of elements from such references might have been "obvious to try."

3. Patentability/Validity -- Obviousness -- Evidence of (§ 115.0903)

Patent and Trademark Office erred, in rejecting as obvious system for detecting and measuring minute quantities of nitrogen compounds, by failing to recognize that appealed claims can be distinguished over combination of prior art references, in view of evidence demonstrating that prior art does not teach

claimed temperature range, despite some overlap of preferred temperature ranges for claimed invention and prior art, since purposes of preferred temperature ranges are different and overlap is mere happenstance.

4. Patentability/Validity -- Obviousness -- In general (§ 115.0901)

Dependent claims are non-obvious under 35 USC 103 if claims from which they depend are non-obvious.

Case History and Disposition:

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Appeal from the U.S. Patent and Trademark Office Board of Patent Appeals and Interferences.

Application for patent by David H. Fine, Serial No. 512,374. From decision of Board of Patent Appeals and Interferences affirming rejection of application, applicant appeals. Reversed; Smith, circuit judge, dissenting with opinion.

Attorneys:

Morris Relson and Darby & Darby, New York, N.Y., (Beverly B. Goodwin with them on the brief) for appellant.

Lee E. Barrett, associate solicitor, Arlington, Va., (Joseph F. Nakamura, solicitor, and Fred E. McKelvey, deputy solicitor, with him on the brief) for appellee.

Judge:

Before Friedman, Smith, and Mayer, circuit judges.

Opinion Text

Opinion By:

Mayer, J.

David H. Fine appeals from a decision of the Board of Patent Appeals and Interferences of the United States Patent and Trademark Office (Board) affirming the rejection of certain claims of his application, Serial No. 512,374, and concluding that his invention would have been obvious to one of ordinary skill in the art and was therefore unpatentable under 35 U.S.C. §103. We reverse.

Background

A. The Invention .

The invention claimed is a system for detecting and measuring minute quantities of nitrogen compounds. According to Fine, the system has the ability to detect the presence of nitrogen compounds in quantities as minute as one part in one billion, and is an effective means to detect drugs and explosives, which emanate nitrogen compound vapors even when they are concealed in luggage and

closed containers.

The claimed invention has three major components: (1) a gas chromatograph which separates a gaseous sample into its constituent parts; (2) a converter which converts the nitrogen compound effluent output of the chromatograph into nitric oxide in a hot, oxygen-rich environment; and (3) a detector for measuring the level of nitric oxide. The claimed invention's sensitivity is achieved by combining nitric oxide with ozone to produce nitrogen dioxide which concurrently causes a detectable luminescence.

The luminescence, which is measured by a visual detector, shows the level of nitric oxide which in turn is a measure of nitrogen compounds found in the sample.

The appealed claims were rejected by the Patent and Trademark Office (PTO) under 35 U.S.C. §103. Claims 60, 63, 77 and 80 were rejected as unpatentable over Eads, Patent No. 3,650,696 (Eads) in view of Warnick, et al., Patent No. 3,746,513 (Warnick). Claims 62, 68, 69, 79, 85 and 86 were rejected as unpatentable over Eads and Warnick in view of Glass, et al., Patent No. 3,207,585 (Glass).

B. The Prior Art .

1. Eads Patent .

Eads discloses a method for separating, identifying and quantitatively monitoring sulfur compounds. The Eads system is used primarily in "air pollution control work in the scientific characterization of odors from sulfur compounds."

The problem addressed by Eads is the tendency of sulfur compounds "to adhere to or react with the surface materials of the sampling and analytical equipment, and/or react with the liquid or gaseous materials in the equipment." Because of this, the accuracy

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of measurement is impaired. To solve the problem, the Eads system collects an air sample containing sulfur compounds in a sulfur-free methanol solution. The liquid is inserted into a gas chromatograph which separates the various sulfur compounds. The compounds are next sent through a pyrolysis furnace where they are oxidized to form sulfur dioxide. Finally, the sulfur dioxide passes through a measuring device called a microcoulometer which uses titration cells to calculate the concentration of sulfur compounds in the sample.

2. Warnick Patent .

Warnick is directed to a means for detecting the quantity of pollutants in the atmosphere. By measuring the chemiluminescence of the reaction between nitric oxide and ozone, the Warnick device can detect the concentration of nitric oxide in a sample gaseous mixture.

Warnick calls for "continuously flowing" a sample gaseous mixture and a reactant containing ozone into a reaction chamber. The chemiluminescence from the resulting reaction is transmitted through a light-transmitting element to produce continuous readouts of the total amount of nitric oxide present in the sample.

3. Glass Patent.

The invention disclosed in Glass is a device for "completely burning a measured amount of a substance and analyzing the combustion products." A fixed amount of a liquid petroleum sample and oxygen are supplied to a flame. The flame is then spark-ignited, causing the sample to burn. The resulting combustion products are then collected and measured, and from this measurement the hydrogen concentration in the sample is computed.

C. The Rejection .

The Examiner rejected claims 60, 63, 77 and 80 because "substitution of the [nitric oxide] detector of Warnick for the sulfur detector of Eads would be an obvious consideration if interested in nitrogen compounds, and would yield the claimed invention." He further asserted that "Eads teaches the

[claimed] combination of chromatograph, combustion, and detection, in that order. . . . Substitution of detectors to measure any component of interest is well within the skill of the art." In rejecting claims 62, 68, 69, 79, 85 and 86, the Examiner said, "Glass et al. teach a flame conversion means followed by a detector, and substitution of the flame conversion means of Glass et al. for the furnace of Eads would be an obvious equivalent and would yield the claimed invention." The Board affirmed the Examiner's rejection.

Discussion

A. Standard of Review .

Obviousness under 35 U.S.C. §103 is " 'a legal conclusion based on factual evidence.' " *Stratoflex, Inc. v. Aeroquip Corp.* , 713 F.2d 1530, 1535, 218 USPQ 871, 876 (Fed. Cir. 1983) (quoting *Stevenson v. Int'l Trade Comm'n* , 612 F.2d 546, 549, 204 USPQ 276, 279 (CCPA 1979)). Therefore, an obviousness determination is not reviewed under the clearly erroneous standard applicable to fact findings, *Raytheon Co. v. Roper Corp.* , 724 F.2d 951, 956, 220 USPQ 592, 596 (Fed. Cir. 1983); it is "reviewed for correctness or error as a matter of law." *In re De Blauwe* , 736 F.2d 699, 703, 222 USPQ 191, 195 (Fed. Cir. 1984).

To reach a proper conclusion under §103, the decisionmaker must step backward in time and into the shoes worn by [a person having ordinary skill in the art] when the invention was unknown and just before it was made. In light of *all* the evidence, the decisionmaker must then determine whether . . . the claimed invention as a whole would have been obvious at *that* time to *that* person. 35 U.S.C. §103. The answer to that question partakes more of the nature of law than of fact, for it is an ultimate conclusion based on a foundation formed of all the probative facts.

Panduit Corp. v. Dennison Mfg. Co. , 810 F.2d 1561, 1566, 1 USPQ2d 1593, 1595-96 (Fed. Cir. 1987).

B. Prima Facie Obviousness .

Fine says the PTO has not established a *prima facie* case of obviousness. He contends the references applied by the Board and Examiner were improperly combined, using hindsight reconstruction, without evidence to support the combination and in the face of contrary teachings in the prior art. He argues that the appealed claims were rejected because the PTO thought it would have been "obvious to try" the claimed invention, an unacceptable basis for rejection.

[1] We agree. The PTO has the burden under section 103 to establish a *prima facie* case of obviousness. See *In re Piasecki* , 745 F.2d 1468, 1471-72, 223 USPQ 785, 787-87 (Fed. Cir. 1984). It can satisfy this burden only by showing some objective teaching in the prior art or that knowledge generally available to one of ordinary skill in the art would lead that individual to combine the relevant teachings of the references. *In re Lalu* , 747 F.2d 703, 705, 223 USPQ 1257, 1258 (Fed. Cir. 1984); see also *Ashland Oil, Inc. v. Delta Resins & Refractories, Inc.* ,

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776 F.2d 281, 297 n.24, 227 USPQ 657, 667 n.24 (Fed. Cir. 1985); *ACS Hosp. Sys., Inc. v. Montefiore Hosp.* , 732 F.2d 1572, 1577, 221 USPQ 929, 933 (Fed. Cir. 1984). This it has not done. The Board points to nothing in the cited references, either alone or in combination, suggesting or teaching Fine's invention.

The primary basis for the Board's affirmance of the Examiner's rejection was that it would have been obvious to substitute the Warnick nitric oxide detector for the Eads sulfur dioxide detector in the Eads system. The Board reiterated the Examiner's bald assertion that "substitution of one type of detector for another in the system of Eads would have been within the skill of the art," but neither of them offered any support for or explanation of this conclusion.

Eads is limited to the analysis of sulfur compounds. The particular problem addressed there is the difficulty of obtaining precise measurements of sulfur compounds because of the tendency of sulfur dioxide to adhere to or react with the sampling analytic equipment or the liquid or gaseous materials in

the equipment. It solves this problem by suggesting that the gaseous sample containing sulfur compounds be absorbed into sulfur-free methanol and then inserted into a gas chromatograph to separate the sulfur compounds.

There is no suggestion in Eads, which focuses on the unique difficulties inherent in the measurement of sulfur, to use that arrangement to detect nitrogen compounds. In fact, Eads says that the presence of nitrogen is undesirable because the concentration of the titration cell components in the sulfur detector is adversely affected by substantial amounts of nitrogen compounds in the sample. So, instead of suggesting that the system be used to detect nitrogen compounds, Eads deliberately seeks to avoid them; it warns against rather than teaches Fine's invention. *See W. L. Gore & Assoc. v. Garlock, Inc.*, 721 F.2d 1540, 1550, 220 USPQ 303, 311 (Fed. Cir. 1983) (error to find obviousness where references "diverge from and teach away from the invention at hand"). In the face of this, one skilled in the art would not be expected to combine a nitrogen-related detector with the Eads system. Accordingly, there is no suggestion to combine Eads and Warnick.

Likewise, the teachings of Warnick are inconsistent with the claimed invention, to some extent. The Warnick claims are directed to a gas stream from engine exhaust "continuously flowing the gaseous mixtures into the reaction chamber" to obtain "continuous readouts" of the amount of nitric oxide in the sample. The other words, it contemplates measuring the total amount of nitric oxide in a continuously flowing gaseous mixture of unseparated nitrogen constituents. By contrast, in Fine each nitrogen compound constituent of the gaseous sample is retained in the Chromatograph for an individual time period so that each exists in discrete, time-separated pulses. *By this process, each constituent may be both identified by its position in time sequence, and measured. The claimed system, therefore, diverges from Warnick and teaches advantages not appreciated or contemplated by it.

Because neither Warnick nor Eads, alone or in combination, suggests the claimed invention, the Board erred in affirming the Examiner's conclusion that it would have been obvious to substitute the Warnick nitric oxide detector for the Eads sulfur dioxide detector in the Eads system. *ACS Hosp. Sys.*, 732 F.2d at 1575-77, 221 USPQ at 931-33. The Eads and Warnick references disclose, at most, that one skilled in the art might find it obvious to try the claimed invention. But whether a particular combination might be "obvious to try" is not a legitimate test of patentability. *In re Geiger*, 815 F.2d 868, 688, 2 USPQ2d 1276, 1278 (Fed. Cir. 1987); *In re Goodwin*, 576 F.2d 375, 377, 198 USPQ 1, 3 (CCPA 1978).

[2] Obviousness is tested by "what the combined teachings of the references would have suggested to those of ordinary skill in the art." *In re Keller*, 642 F.2d 413, 425, 208 USPQ 871, 881 (CCPA 1981). But it "cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." *ACS Hosp. Sys.*, 732 F.2d at 1577, 221 USPQ at 933. And "teachings of references can be combined *only* if there is some suggestion or incentive to do so." *Id.* Here, the prior art contains none.

Instead, the Examiner relies on hindsight in reaching his obviousness determination.

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But this court has said, "To imbue one of ordinary skill in the art with knowledge of the invention in suit, when no prior art reference or references of record convey or suggest that knowledge, is to fall victim to the insidious effect of a hindsight syndrome wherein that which only the inventor taught is used against its teacher." *W. L. Gore*, 721 F.2d at 1553, 220 USPQ at 312-13. It is essential that "the decisionmaker forget what he or she has been taught at trial about the claimed invention and cast the mind back to the time the invention was made . . . to occupy the mind of one skilled in the art who is presented only with the references, and who is normally guided by the then-accepted wisdom in the art." *Id.* One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention.

C. Advantage Not Appreciated by the Prior Art .

[3] The Board erred not only in improperly combining the Eads and Warnick references but also in

failing to appreciate that the appealed claims can be distinguished over that combination. A material limitation of the claimed system is that the conversion to nitric oxide occur in the range of 600°C to 1700°C. The purpose of this limitation is to prevent nitrogen from other sources, such as the air, from being converted to nitric oxide and thereby distorting the measurement of nitric oxide derived from the nitrogen compounds of the sample.

The claimed nitric oxide conversion temperature is not disclosed in Warnick. Although Eads describes a preferred temperature of 675°C to 725°C, the purpose of this range is different from that of Fine. Eads requires the 675°C to 725°C range because it affords a temperature low enough to avoid formation of unwanted sulfur trioxide, yet high enough to avoid formation of unwanted sulfides. Fine's temperature range, in contrast, does not seek to avoid the formation of sulfur compounds or even nitrogen compounds. It enables the system to break down the nitrogen compounds of the sample while avoiding the destruction of background nitrogen gas. There is a partial overlap, of course, but this is mere happenstance. Because the purposes of the two temperature ranges are entirely unrelated, Eads does not teach use of the claimed range. *See In re Geiger*, 815 F.2d at 688, 2 USPQ2d at 1278. The Board erred by concluding otherwise.

D. Unexpected Results .

Because we reverse for failure to establish a *prima facie* case of obviousness, we need not reach Fine's contention that the Board failed to accord proper weight to the objective evidence of unexpected superior results. *Id.*

E. The "Flame" Claims .

[4] Claims 62, 68, 69, 79, 85 and 86 relate to the oxygen-rich flame conversion means of the claimed invention. These "flame" claims depend from either apparatus claim 60 or method claim 77. Dependent claims are nonobvious under section 103 if the independent claims from which they depend are nonobvious. *Hartness Int'l, Inc. v. Simplimatic Eng'g Co.*, 819 F.2d 1100, 1108, 2 USPQ2d 1826, 1831 (Fed. Cir. 1987); *In re Abele*, 684 F.2d 902, 910, 214 USPQ 682, 689 (CCPA 1982); *see also In re Sernaker*, 702 F.2d 989, 991, 217 USPQ 1, 3 (Fed. Cir. 1983). In view of our conclusion that claims 60 and 77 are nonobvious, the dependent "flame" claims are also patentable.

Conclusion

The Board's decision affirming the Examiner's rejection of claims 60, 62, 63, 68, 69, 77, 79, 80, 85 and 86 of Fine's application as unpatentable over the prior art under 35 U.S.C. §103 is *REVERSED*.

Footnotes

Footnote *. The Solicitor argues that the contents of Attachment C of Fine's brief were not before the Board and may not properly be considered here. However, we need not rely on Attachment C. It is merely illustrative of the qualitative separation of nitrogen compounds which occurs in Fine's system. The fact that the various constituents exit at discrete intervals is shown by the specification which was before the Board and which may appropriately be considered on appeal. *See, e.g., Astra-Sjuco, A.B. v. United States Int'l Trade Comm'n*, 629 F.2d 682, 686, 207 USPQ 1, 5 (CCPA 1980) (claims must be construed in light of specification).

Dissenting Opinion Text

Dissent By:

Smith, circuit judge, dissenting.

I respectfully dissent. I am of the firm belief that the prior art references, relied upon by the PTO to establish its *prima facie* case of obviousness, in combination teach and suggest Fine's invention to one

skilled in the art. Also, I firmly believe that Fine failed to rebut the PTO's prima facie case. On this basis, I would affirm the board's determination sustaining the examiner's rejection, pursuant to 35 U.S.C. §103, of Fine's claims on appeal before this court.

- End of Case -

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FULL TEXT OF CASES (USPQ2D)

All Other Cases

Sensonics Inc. v. Aerosonic Corp. (CA FC) 38 USPQ2d 1551 (4/24/1996)

Sensonics Inc. v. Aerosonic Corp. (CA FC) 38 USPQ2d 1551

Sensonics Inc. v. Aerosonic Corp.**U.S. Court of Appeals Federal Circuit**
38 USPQ2d 1551Decided April 24, 1996
Nos. 95-1058, -1062, -1098**Headnotes****PATENTS****1. Patentability/Validity -- Obviousness -- Combining references (§ 115.0905)**

Claimed vibrator for aircraft instruments is not obvious in view of prior art references considered alone or in combination, since there is no teaching or suggestion whereby person of ordinary skill in art would have been led to select particular mechanical and electrical structures and concepts and combine them as did inventor, and since drawing on hindsight knowledge of patented invention, when prior art does not contain or suggest that knowledge, is improper use of invention as template for its own reconstruction.

2. Infringement -- Defenses -- Fraud or unclean hands (§ 120.1111)

Failure to disclose inventor's prior patent during prosecution of patent in suit did not constitute inequitable conduct, since defendant's failure to mention prior patent in its request for re-examination of patent in suit weighs heavily against its contention that prior patent was material prior art, and since there is no evidence of culpable intent.

3. Infringement -- Willful (§ 120.16)

Federal district court did not clearly err by concluding that defendants did not willfully infringe vibrator patent in suit, even though opinion of defendants' counsel does not mention defendants' copying and other objective indicia of unobviousness, and infringement continued even after validity of patent was

confirmed on re-examination, since issue of willfulness raises questions of credibility as well as weight, and findings thereon are not readily reversed, and since infringement occurred four months prior to patent's expiration.

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REMEDIES

4. Monetary -- Damages -- Patents -- Lost profits (§ 510.0507.05)

Infringement defendant's failure to retain production records during litigation gives rise to strong inference that such records would have been unfavorable to defendant, since it is not necessary to establish bad faith in order to draw adverse inference from "purposeful" action, and since it is appropriate that doubt be resolved against defendant in view of clear duty to keep and preserve records of acts for which infringement had been charged; federal district court's determination that 7,347 infringing units had been produced by defendant, based on extrapolation from production records available for final six months of patent's term, represents best available reconstruction of infringing activity, but court's reduction of extrapolated production by 33 percent to account for device repair or inefficiency in production is not supported by evidence.

5. Monetary -- Damages -- Patents -- Increased damages (§ 510.0507.07)

Federal district court did not abuse its discretion by declining to award enhanced damages for patent infringement, since enhanced damages are punitive rather than compensatory, and depend on showing of willful infringement or other indicium of bad faith warranting punitive damages, and since court's finding that infringement was not willful was not clear error.

6. Monetary -- Damages -- Prejudgment interest (§ 510.0511)

Prejudgment interest in patent cases is withheld only under exceptional circumstances, and denial of such award based on calculation difficulties alone is error; prejudgment interest award is therefore warranted in present patent action in which there is no circumstance that would make such award unfair or inappropriate.

7. Monetary -- Attorneys' fees; costs -- Patents -- Exceptional case (§ 510.0905.03)

Bad faith and willful infringement are not only criteria whereby case may be deemed "exceptional," since litigation misconduct and unprofessional behavior are relevant to award of attorneys' fees; remand of present case for determination of whether there was bad faith or vexatious behavior is therefore warranted, even though federal district court did not err in concluding that defendants did not willfully infringe.

PATENTS

8. Infringement -- Inducement (§ 120.15)

REMEDIES

Monetary -- Damages -- Personal liability of corporate officials (§ 510.0513)

Federal district court properly concluded that individual defendant who was founder, owner, president, chief executive officer, and chief of engineering of infringing corporation is liable for inducement to infringe, and is jointly and severally liable for amount of judgment, since weight of evidence is strongly contrary to defendant's testimony that he was without authority to control or discontinue production of infringing device after becoming aware of plaintiff's patent rights, and since court therefore did not clearly err in determining that testimony was not credible.

Particular patents -- Electrical -- Tapping device

3,863,114, DeMayo, tapping device for generating periodic mechanical impulses, ruling that patent is enforceable, not invalid, and infringed is affirmed.

Case History and Disposition:

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Appeal from the U.S. District Court for the Middle District of Florida, Merhige, J.

Action by Sensonics Inc. against Aerosonic Corp. and Herbert J. Frank for patent infringement. From ruling that patent claims are enforceable, not invalid, and infringed, and that defendant Herbert J. Frank is personally liable for inducing infringement, defendants appeal. Plaintiff cross-appeals measure of damages and denial of enhanced damages and attorneys' fees. Affirmed in part, modified and reversed in part, and remanded.

Attorneys:

Daniel P. Burke, of Galgano & Burke, Hauppauge, N.Y., for plaintiff/cross- appellant.

Robert E. Greenstien, of Honigman, Miller, Schwartz & Cohn, West Palm Beach, Fla.; Anne E. Brookes, John T. Klug, Louis K. Bonham, and John G. Flaim, of Honigman, Miller, Schwartz & Cohn, Houston, Texas; Robert W. Boos and Kevin M. Gilhool, of Honigman, Miller, Schwartz & Cohn, Tampa, Fla., for defendant-appellant Aerosonic Corp.

Sybil Meloy, Lisa S. Mankofsky, and Patricia D. Granados, of Foley & Lardner, Washington, D.C., for defendant-appellant Herbert J. Frank.

Judge:

Before Newman, circuit judge, Bennett, senior circuit judge, and Bryson, circuit judge.

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Opinion Text**Opinion By:**

Newman, J.

This consolidated appeal and cross-appeal concern United States Patent No. 3,863,114 (the '114 patent) owned by Sensonics, Inc. The defendants, Aerosonic Corp. and Herbert J. Frank, each appeals certain aspects of the judgment of the United States District Court for the Middle District of Florida. 1 Aerosonic appeals the district court's ruling that the '114 patent is valid and enforceable, and also appeals the ruling of infringement as to some of the patent claims but not as to others. Mr. Frank appeals the ruling that he is personally liable for inducement to infringe the Sensonics patent. Sensonics cross-appeals the measure of damages, and the court's denial of enhanced damages and attorney fees.

THE PATENTED INVENTION

The '114 patent is for a "Tapping Device for Generating Periodic Mechanical Pulses," inventor John F. DeMayo. Mr. DeMayo is a founder and officer of Sensonics. The tapping device, also called a "vibrator," is used primarily with aircraft instruments having moving indicators. Mechanical pulses, that is, taps, gently vibrate the moving parts in order to free them of the effects of static friction, permitting the indicator to move freely and thus with greater accuracy and reliability. Such devices require accurate and reliable operation for extended periods of time and over wide temperature and voltage ranges. They require careful control of the strength of the vibration pulses in order to avoid causing errors in or requiring recalibration of the aircraft instrument.

The invention claimed in the '114 patent is an electromagnetic vibrator that is easier to manufacture, more accurate, easier to adjust, and less expensive than prior devices. Its structure of a unitary base with integrally formed anvil and armature support eliminated the welding and soldering steps of earlier devices, and also assured a true and consistent path for the magnetic flux. Another advantageous structural component is the adjustment element for the strength of the vibration pulses, in the form of a screw which extends through the armature to the magnetic core. The head of the screw provides the stop for the moving armature, and thus adjustment of the screw enables ready adjustment of the mechanical pulses without removing the device from its casing, a disadvantage of prior vibrators. It was not disputed that Aerosonic copied the Sensonics device in complete detail, and replaced the vibrating-reed design of the vibrator that Aerosonic was then making commercially. Mr. Frank and other witnesses testified that the vibrating-reed design was hard to manufacture, had an unacceptably high failure rate after installation, and was deficient in that it did not allow adjustment of the strength of the mechanical pulses. The superiority of the Sensonics device in accuracy, reliability, and cost, was undisputed.

PATENT VALIDITY

Aerosonic raised the defense of patent invalidity based on obviousness in terms of 35 U.S.C. Section 103. The principal prior art at trial was an earlier invention of Mr. DeMayo, described in United States Patent No. 3,507,339 (the '339 patent). This patent was not cited as a reference during prosecution of

the application that led to the '114 patent.

Mr. DeMayo testified that the '339 patent represented an earlier effort to make an improved mechanical vibrator. There was evidence that the '339 design had some advantages over prior devices, but that its shortcomings included manufacturing complexity, increased size, multiple components, difficulty of assembly, difficulty of adjustment, and too high a failure rate. Mr. DeMayo testified that he continued to work to solve these problems, and that after several additional years of effort he succeeded in doing so, with the vibrator that became the subject of the '114 patent. Although the '114 design and the '339 design have several similarities, there was evidence that the changes embodied in the '114 device achieved the simplicity and efficiency of manufacture, easy and accurate adjustment, compactness, quietness in operation, and reliability, that were inadequate in the '339 device.

The '339 device has a screw extending through the armature to the magnetic core. This screw is soldered into place in order to provide sufficient contact within the device to ensure magnetic flux, and is not usable to adjust the strength of the pulses. Although at trial Aerosonic argued that it was obvious to make the design change of an adjustable screw, the district court observed that this element of the '114 invention provided significant advantages and remedied deficiencies of prior devices. The pulse strength for the '339 device was only adjustable from below, and thus was not readily adjusted

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after installation. In contrast, the '114 device could be readily adjusted not only during manufacture but also after assembly and after installation in the aircraft instrument. Although Aerosonic points to the simplicity of this adjustment mechanism, simplicity does not establish obviousness; indeed, simplicity may represent a significant and unobvious advance over the complexity of prior devices.

The district court referred to the factual underpinnings of the determination of obviousness as set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966). Applying these criteria, the court discussed the testimony of Aerosonic's expert witness concerning the prior art. In addition to the '339 patent, the references relied on by Aerosonic were two patents on "telegraph- sounders" that were designed to make noise, a patent on a magnetically operated switch designed to absorb any shock created by contact of its armature and magnetic core, a patent on a relay for telephone lines to control secondary signals, and a patent for an automobile voltage regulator.

[1] The district court concluded that "[c]onsidered in their entirety, the references discussed by defendants' expert do not, in the court's view, lead one of ordinary skill in the art to the invention in suit." We agree that the references, alone or in combination, do not make obvious the '114 invention. There is no teaching or suggestion whereby a person of ordinary skill would have been led to select these mechanical and electrical structures and concepts and combine them as did DeMayo in the '114 invention. To draw on hindsight knowledge of the patented invention, when the prior art does not contain or suggest that knowledge, is to use the invention as a template for its own reconstruction -- an illogical and inappropriate process by which to determine patentability. *W.L. Gore & Assoc. v. Garlock, Inc.*, 721 F.2d 1540, 1553, 220 USPQ 303, 312-13 (Fed. Cir. 1983). The invention must be viewed not after the blueprint has been drawn by the inventor, but as it would have been perceived in the state of the art that existed at the time the invention was made. *Interconnect Planning Corp. v. Feil*, 774 F.2d 1132, 1138, 227 USPQ 543, 547 (Fed. Cir. 1985).

The DeMayo '114 device was placed in commercial production by Sensonics. Aerosonic purchased fifty of the Sensonics vibrators from Budd Electronics Corp. An Aerosonic engineer testified that he was instructed by Mr. Frank to copy every detail of the Sensonics device, mentioning the number of turns of wire in the electromagnet and the wire thickness, the tension of the spring, the posts supporting the armature, the unitary construction, the adjustable screw, etc. Mr. Frank and other employees of Aerosonic testified that there were no acceptable substitutes in the industry for the DeMayo '114 vibrator design.

Patent invalidity must be proved by clear and convincing evidence. The differences from the prior art that were shown at trial, the inadequacies of prior vibrators including DeMayo's earlier '339 design, and

the technologic advantages and commercial success of the '114 invention, well support the district court's conclusion that invalidity based on obviousness had not been proved. The decision that the patent is valid is affirmed.

PATENT ENFORCEABILITY

Aerosonic charged Sensonics with inequitable conduct before the Patent and Trademark Office because Sensonics did not bring to the attention of the patent examiner the DeMayo '339 patent. The district court held that the intent element of inequitable conduct had not been shown, and referred to the evidence presented at trial of Sensonics' good faith. The court also observed that Aerosonic's own patent counsel did not initially notice the relevance of the '339 patent, and that the '339 patent was not cited by Aerosonic in its reexamination request which was made during the litigation, and for which the litigation was stayed.

The district court found that Mr. DeMayo, who testified at trial, was not aware of a need to direct the examiner to the '339 patent. Mr. DeMayo also testified that he did not believe that the '339 patent was relevant to the '114 invention due to the differences and significant drawbacks in the '339 design; this testimony was supported by other evidence of the differences and drawbacks of the '339 and other prior devices.

[2] Aerosonic presses the argument that Sensonics did not seek reexamination of the '114 patent in light of the '339 patent until after expiration of the '114 patent. The '114 patent expired during the litigation. The district court observed that Aerosonic had earlier requested reexamination of the '114 patent, but that Aerosonic did not mention the '339 patent in its reexamination papers. Indeed, Aerosonic's omission of the '339 patent from its reexamination request weighs heavily against its argument that the '339 patent was material prior art.

The burden of proof of inequitable conduct was upon Aerosonic. The factual predicates of both (1) a withholding of material

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prior art and (2) the intent thereby to deceive or mislead the patent examiner into allowing the claims, must be shown by clear and convincing evidence. *Kingsdown Medical Consultants, Ltd. v. Hollister*, 863 F.2d 867, 872, 9 USPQ2d 1384, 1389 (Fed. Cir. 1988), cert. denied, 490 U.S. 1067 (1989). There was no evidence of culpable intent. The totality of the evidence, including the evidence of good faith, well supports the district court's finding that intent to deceive or mislead the examiner was not shown.

Absent reversible error in the district court's findings and conclusion, we affirm the decision that there was not inequitable conduct before the patent office and that the '114 patent is enforceable.

WILLFUL INFRINGEMENT

Aerosonic stipulated that it infringed claims 2 and 7. The district court found that Aerosonic also infringed claims 3, 8 and 11. Aerosonic appeals this latter finding, advising that we need not reach claims 3, 8, and 11 should we sustain the validity of claims 2 or 7. Thus the only infringement issue is Sensonics's cross-appeal of the district court's finding that Aerosonic's infringement was not willful. Sensonics states that the court clearly erred in failing to find that the infringement was willful, referring to Aerosonic's deliberate and meticulous copying of the Sensonics device, and Aerosonic's delay of eight months before consulting patent counsel after it received written notice of infringement, as evidence that Aerosonic willfully disregarded or did not intend to respect the law. The devices that Aerosonic purchased from Budd Electronics and copied were all labelled with Sensonics' name. Sensonics states that the opinion of counsel that Aerosonic produced at trial was "protective" and was not a complete analysis, and that Aerosonic's continuing infringement after actual notice of Sensonics' patent was with knowledge and disregard of Sensonics' legal rights. Indeed, the opinion of counsel makes no mention of Aerosonic's copying and other objective indicia of unobviousness, although precedent requires that these factors be considered. See *Stratoflex v. Aeroquip Corp.*, 713 F.2d

1530, 1539, 216 USPQ 871, 879 (Fed. Cir. 1983) (evidence of objective considerations must always be taken into account).

[3] Although the opinion of Aerosonic's counsel is flawed, the issue of willfulness raises questions of credibility as well as weight, and findings thereon are not readily reversed. See *King Instrument Corp. v. Otari Corp.*, 767 F.2d 853, 867, 226 USPQ 402, 412 (Fed. Cir. 1985) (giving due deference to the trier's right to determine credibility and weight). The district court found that Aerosonic timely retained patent counsel and reasonably relied on counsel's opinion. Although it is relevant that the infringement was continued even after the '114 patent was confirmed on reexamination, this occurred four months before patent expiration, and Sensonics does not argue that this event of itself signals willful infringement. On the whole we do not discern clear error in the district court's findings and conclusion on the issue of willful infringement.

DAMAGES

Sensonics appeals the district court's measure of damages, on the ground that the district court incorrectly assessed the number of infringing devices made by Aerosonic.

The criteria for lost profits damages that are summarized in *Panduit Corp. v. Stahl Bros. Fiber Works, Inc.*, 575 F.2d 1152, 197 USPQ 726 (6th Cir. 1978), were applied by the district court. The court found that Sensonics had proved (1) demand for the patented product, (2) Sensonics' ability to meet that demand, (3) the absence of acceptable non-infringing substitutes, and (4) the amount of lost profits per unit. The principal issue at trial was not any of these criteria, but the total number of devices that were made by Aerosonic during the period between actual notice of infringement on September 14, 1989 and the expiration of the '114 patent on January 28, 1992.

This issue arose because Aerosonic had apparently destroyed its manufacturing records after this litigation began. No manufacturing records were available for the relevant period except for a handwritten log book of serial numbers that covered the final six months preceding the expiration of the patent. This log commenced with number 21,267 in July 1991, after this suit had been pending for a year. It was the only remaining evidence of the number of devices manufactured. Aerosonic argues that the burden of proof of damages is upon the patentee, and that since the number of devices manufactured could not be proved, the burden could not be met.

However, if actual damages can not be ascertained with precision because the evidence available from the infringer is inadequate, damages may be estimated on the best available evidence, taking cognizance of the reason for the inadequacy of proof and

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resolving doubt against the infringer. See *Westinghouse Elec. & Mfg. Co.*, 225 U.S. 604, 620 (1912) (infringer bears the risk when precise calculation is not possible); *Kori Corp. v. Wilco Marsh Buggies and Draglines, Inc.*, 761 F.2d 649, 655, 225 USPQ 985, 989 (Fed. Cir.) ("Fundamental principles of justice require us to throw any risk of uncertainty upon the wrongdoer rather than upon the injured party.") (citing *Story Parchment Co. v. Paterson Parchment Co.*, 282 U.S. 555, 563 (1931)), *cert. denied*, 474 U.S. 902 (1985).

When the calculation of damages is impeded by incomplete records of the infringer, adverse inferences are appropriately drawn. See *Lam, Inc. v. Johns-Manville Corp.*, 718 F.2d 1056, 1065, 219 USPQ 670, 675 (Fed. Cir. 1983) (any adverse consequences rest upon the infringer when inability to ascertain lost profits is due to the infringer's failure to keep accurate or complete records). When manufacturing records were destroyed after the litigation commenced, strong inferences adverse to the infringer may be drawn. *Beatrice Foods Co. v. New England Printing and Lithographing Co.*, 899 F.2d 1171, 1176, 14 USPQ2d 1020, 1024 (Fed. Cir. 1990).

The district court found that the final six months' log was the only evidence of the number of devices manufactured. The log listed 1,037 vibrators to which serial numbers were given during the final six months of the life of the '114 patent. From this number the district court extrapolated back, assuming

an equal rate of production over the previous three years, to a total of 7,347 units manufactured between the date notice of infringement was given to Aerosonic and the date of patent expiration. See *Beatrice Foods*, 899 F.2d at 1176, 14 USPQ2d at 1024 (damages appropriately measured by reconstruction when infringer had destroyed its invoices). Sensonics states that this extrapolation gives an unrealistically low figure because Aerosonic would reasonably be expected to have cut back on infringing production for the last few months of patent life, especially because this litigation was ongoing.

[4] Sensonics states that Aerosonic's failure to retain production records during the litigation period requires that strong adverse inferences be drawn. We agree that this circumstance gives rise to a strong inference that the records would have been unfavorable to Aerosonic. *Lam v. Johns-Manville*, 718 F.2d at 1065, 219 USPQ at 675. Indeed, as the court discussed in *Nation-Wide Check Corp. v. Forest Hills Distribs., Inc.*, 692 F.2d 214, 218 (1st Cir. 1982), it is not necessary to establish bad faith in order to draw an adverse inference from "purposeful" action:

The adverse inference is based on two rationales, one evidentiary and one not. The evidentiary rationale is nothing more than the common sense observation that a party who has notice that a document is relevant to litigation and who proceeds to destroy the document is more likely to have been threatened by the document than is a party in the same position who does not destroy the document. . . .

The other rationale for the inference has to do with its prophylactic and punitive effects. Allowing the trier of fact to draw the inference presumably deters parties from destroying relevant evidence before it can be introduced at trial.

citing 2 *Wigmore on Evidence* Section 291, at 228 (Chadbourn rev. 1979).

Aerosonic had the clear duty of keeping and preserving records of the acts for which infringement had been charged, and it is appropriate that doubt be resolved against Aerosonic. Although Aerosonic's actions warrant adverse inferences, Sensonics does not suggest an alternative to the extrapolation method adopted by the district court. Thus the district court's extrapolation represents the best available reconstruction of the infringing activity, and is sustained.

The district court then reduced the extrapolated production of 7,347 units by 33% "in order to account for any duplication resulting from device repair or inefficiency in production of the vibrators."

Sensonics states that this reduction is unsupported by evidence, and contrary to the great weight of the evidence. We must agree. There was no evidence that device repair or production inefficiency was reflected in the log showing the serial number that was applied when the vibrator was ready for shipment or installation. Mr. Frank, who was the chief executive officer of Aerosonic during this period, testified that: "The serial number is put on the vibrator just before it is shipped, or before we put it into an indicator." On this procedure, any device repair or inefficiency in production would not be reflected in the serial number.

The Aerosonic log that was produced included repairs. It was the only record of repairs that was produced, and showed a repair rate of less than 0.4%, without a change of serial number for the repaired unit. Aerosonic did not establish that 33% or any other number of vibrators bore multiple serial numbers or were given new serial numbers after they were returned for repair. Further, if evidentiary imprecision is due to

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inadequacy of the infringer's records, uncertainty is resolved against the wrongdoer. *Kori v. Wilco*, 761 F.2d at 655, 225 USPQ at 989; *Lam v. Johns-Manville*, 718 F.2d at 1065, 219 USPQ at 675. Aerosonic states that damages are measured not by the number of devices manufactured but by the number of devices sold before patent expiration, arguing that there is no record evidence of when the devices listed on the serial number log were sold, but that they would have been sold mostly after patent expiration. The statement of law is incorrect. The patent statute grants the patentee the right to exclude others from making, using, or selling the patented subject matter. 35 U.S.C. Section 271. Any of these activities during the patent term is an infringement of the patent right.

In the absence of any evidence that a significant number of the units to which a serial number was given were not separate manufactures, the district court's reduction of the total of 7,347 is clearly in error, and is reversed. Damages shall be paid on 7,347 units. The district court's decision is modified accordingly.

ENHANCEMENT OF DAMAGES

Sensonics states that the district court abused its discretion in declining to enhance damages in accordance with 35 U.S.C. Section 284 ("the court may increase the damages up to three times the amount found or assessed"). The district court's decision with respect to the enhancement of damages will be sustained unless it was based on an incorrect conclusion of law, clearly erroneous findings of fact, or a clear error of judgment. *National Presto Industries, Inc. v. The West Bend Co.*, 76 F.3d 1185, 1193, 37 USPQ2d 1685, 1691 (Fed. Cir. 1996).

[5] Section 284 does not state the circumstances in which damages may be enhanced by the court. In *Yarway Corp. v. Eur-Control USA, Inc.*, 775 F.2d 268, 277, 227 USPQ 352, 358 (Fed. Cir. 1985) the court explained that "enhancement of damages must be premised on willful infringement or bad faith." See *Shatterproof Glass Corp. v. Libbey-Owens Ford Co.*, 758 F.2d 613, 628, 225 USPQ 634, 644 (Fed. Cir.), cert. dismissed, 474 U.S. 976 (1985) (absent willful infringement, enhanced damages are usually not warranted). As elaborated in *Beatrice Foods Co. v. New England Printing and Lithographing Co.*, 923 F.2d 1576, 1580, 17 USPQ2d 1553, 1556 (1991), enhanced damages are punitive, not compensatory. Enhancement is not a substitute for perceived inadequacies in the calculation of actual damages, but depends on a showing of willful infringement or other indicium of bad faith warranting punitive damages.

The district court declined to enhance damages. Since we have affirmed the finding that the infringement was not willful, we conclude that the district court acted within its discretion in declining to enhance damages pursuant to Section 284.

PREJUDGMENT INTEREST

[6] The district court denied prejudgment interest, referring to the difficulty of its calculation. It was established in *General Motors Corp. v. Devex Corp.*, 461 U.S. 648, 217 USPQ 1185 (1983) that prejudgment interest is the rule, not the exception. The Supreme Court explained that the denial of prejudgment interest simply creates an incentive to prolong litigation, and that prejudgment interest in patent cases is withheld only under exceptional circumstances. 461 U.S. at 656-57, 217 USPQ at 1189. In *Lummus Industries, Inc. v. D.M. & E. Corp.*, 862 F.2d 267, 274-75, 8 USPQ2d 1983, 1988 (Fed. Cir. 1988) the court held that "[t]o deny prejudgment interest based on calculation difficulties alone would be error."

We have been directed to no circumstance that would make it unfair or inappropriate to award prejudgment interest in this case. As stated in *General Motors v. Devex*, an award of prejudgment interest serves to make the patent owner whole, for damages properly include the foregone use of money of which the patentee was wrongly deprived. 461 U.S. at 655-56, 217 USPQ 1188. Sensonics has included in its appellate brief a reasonable methodology for calculation of prejudgment interest. Aerosonic has not challenged the rate or the arithmetic. The denial of prejudgment interest is reversed. On remand prejudgment interest, calculated in accordance with the Sensonics method, shall be awarded.

ATTORNEY FEES

The district court did not separate, in its analysis, the criteria for enhancement of damages and for the award of attorney fees. They are not necessarily the same, although the contributing factors often overlap.

[7] The award of attorney fees requires a threshold determination that this is an "exceptional case." 35 U.S.C. Section 285. Bad faith and willful infringement are not the only criteria whereby a case may be deemed to be "exceptional," although when either is

present the requirement is more readily met. Litigation misconduct and unprofessional behavior are relevant to the award of attorney fees, and may suffice to make a case exceptional under Section 285. *Spectra-Physics Inc. v. Coherent, Inc.*, 827 F.2d 1524, 1537, 3 USPQ2d 1737, 1746 (Fed. Cir.), cert. denied, 484 U.S. 954 (1987). See *Kloster Speedsteel AB v. Crucible Inc.*, 793 F.2d 1565, 1580, 230 USPQ 81, 91 (Fed. Cir. 1986) (bad faith in pretrial and trial stages, by counsel or party, may render the case exceptional under Section 285).

The district court had declined to enhance damages, on the ground that the infringement was not willful. However, the district court did not discuss whether there were actions of bad faith sufficient to meet the criterion of "exceptional case" and to warrant the award of attorney fees. Sensonics points to Aerosonic's pre-litigation false statement that it was not manufacturing the device but was simply reselling it, citing Mr. Frank's letter of September 21, 1989 to Sensonics' counsel. 2 Sensonics states that this led it to sue Budd Electronics Corporation in the Eastern District of Pennsylvania. At trial Mr. Frank admitted that he ordered the copying and manufacture of the Sensonics device.

At his deposition Aerosonic employee Ronald Miller was testifying to similar effect when Aerosonic's attorney McDonald passed him a note stating "DID NOT COPY" (plaintiff's exhibit 52). These procedures, of which Sensonics complains forcefully, demean the litigation process.

Sensonics also points to Aerosonic's motion to the district court filed October 22, 1991, opposing Sensonics motion of October 15, 1991 to lift the stay for reexamination, Aerosonic assuring the court that the reexamination certificate had not issued, when it had issued on September 24, 1991. Before this aspect was resolved another year passed, during which the patent expired.

Combined with these actions is the matter of manufacturing records. Aerosonic employees admitted that prior serial number logs existed as late as eighteen months after the suit was filed, although no witness could tell what became of these logs. Aerosonic employees testified that they did not know how many devices were manufactured, even for purposes of warranty control. Employees in responsible management positions testified that they did not have any records or any idea of how many devices were manufactured. The Supervisor of the Electronics Department, who personally kept the final six-months' log of serial numbers, testified that a previous log must have existed when she started the remaining log with serial number 21,267, but that it no longer existed or could be produced. As we have discussed, there is an uncompromising duty to preserve relevant records, and particularly after litigation has begun.

It is the judicial duty to refuse to condone behavior that exceeds reasonable litigation tactics. The district court made no findings concerning whether Aerosonic's actions were taken in good faith. Indeed, the court may consider the litigation actions of both sides in connection with Section 285. See *Beatrice Foods*, 923 F.2d at 1580, 17 USPQ2d at 1556 (requiring findings of fact on the issue of bad faith). We remand for determination of whether there was bad faith or vexatious behavior or other grounds for deeming this case exceptional in terms of 35 U.S.C. Section 285. If so, the district court may determine whether the award of attorney fees is warranted.

APPEAL OF HERBERT J. FRANK

Mr. Frank was the founder, owner, president, chief executive officer, and chief of engineering of Aerosonic. In 1990 he became chairman, his son-in-law became president, and Mr. Frank continued as chief executive officer for an additional two years. The district court found Mr. Frank personally liable for inducement to infringe the '114 patent. Mr. Frank appeals.

The tort of "inducement" under 35 U.S.C. Section 271(b), when applied to invoke personal liability, is premised on a concept of tortfeasance whereby persons in authority and control may in appropriate circumstances be deemed liable for wrongdoing, when inducing direct infringement by another. See *Water Technologies Corp. v. Calco, Ltd.*, 850 F.2d 660, 7 USPQ2d 1097 (Fed. Cir.) (finding liability for inducement based on specific circumstances of personal control of Calco's manufacture of the

infringing products), *cert. denied*, 488 U.S. 968 (1988); *Orthokinetics, Inc. v. Safety Travel Chairs, Inc.*, 806 F.2d 1565, 1578-79, 1 USPQ2d 1081, 1090 (Fed. Cir. 1986) (corporate officers who actively aid and abet their corporation's infringement may be personally liable for inducing infringement).

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[8] Mr. Frank testified that he did not have the authority to control or discontinue production of the device after he became aware of Sensonics' patent rights or as the litigation progressed. The district court did not believe this statement. We do not discern clear error in this credibility determination, for the weight of evidence was strongly contrary to this testimony. In the absence of reversible error, the district court's ruling that Mr. Frank is liable for inducement to infringe, and jointly and severally liable for the judgment, is affirmed.

Summary

The district court's rulings of validity, enforceability, and infringement of the '114 patent are affirmed. Damages shall be measured on the basis of 7,347 infringing units, without enhancement. The denial of prejudgment interest is reversed. On remand the damages award and interest shall be recalculated, and the district court shall make findings on the issue of whether this is an exceptional case for the purposes of 35 U.S.C. Section 285.

On Mr. Frank's individual appeal, the district court's judgment is affirmed.

Costs to Sensonics. *AFFIRMED IN PART, MODIFIED AND REVERSED IN PART, AND REMANDED*.

Footnotes

Footnote 1. *Sensonics, Inc. v. Aerosonic Corp.*, Nos. 90-84-T-23A and 93-724-T-23A (M.D. Fla. Oct. 11 and Nov. 4, 1994).

Footnote 2. Mr. Frank, then president, chief executive officer, and chief of engineering at Aerosonic, wrote: "Aerosonic Corporation purchased the vibrators from another company, and if you have some legal action, it would be against them." [signed] "Herbert J. Frank, President".

- End of Case -

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